

# REPORT DOCUMENTATION PAGE

*Form Approved  
OMB No. 0704-0188*

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<b>1. REPORT DATE (DD-MM-YYYY)</b>			<b>2. REPORT TYPE</b> Technical Papers	<b>3. DATES COVERED (From - To)</b>	
<b>4. TITLE AND SUBTITLE</b>			5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER  6. AUTHOR(S)  5d. PROJECT NUMBER 2362 5e. TASK NUMBER MIG2 5f. WORK UNIT NUMBER		
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b>  Air Force Research Laboratory (AFMC) AFRL/PRS 5 Pollux Drive Edwards AFB CA 93524-7048			<b>8. PERFORMING ORGANIZATION REPORT</b>		
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>  Air Force Research Laboratory (AFMC) AFRL/PRS 5 Pollux Drive Edwards AFB CA 93524-7048			10. SPONSOR/MONITOR'S ACRONYM(S)  11. SPONSOR/MONITOR'S NUMBER(S)		
<b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b>  Approved for public release; distribution unlimited.					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT</b>					
<b>15. SUBJECT TERMS</b>					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>	<b>18. NUMBER OF PAGES</b>	<b>19a. NAME OF RESPONSIBLE PERSON</b> Leilani Richardson
<b>a. REPORT</b> Unclassified	<b>b. ABSTRACT</b> Unclassified	<b>c. THIS PAGE</b> Unclassified	A		<b>19b. TELEPHONE NUMBER</b> (include area code) (661) 275-5015

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std. Z39-18

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*C97*

MEMORANDUM FOR PRS (Contractor/In-House Publication)

TP-FY99-0133  
✓ Spreadsheet  
✓ OTS

FROM: PROI (TI) (STINFO)

16 June 1999

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-TP-FY99-0133  
C.T. Liu, "Microstructure Induced Inhomogeneous Strain in a Particulate Composite"

1999 ASME Summer Conference

(Public Release)

# **Microstructure Induced Inhomogeneous Strain in a Particulate Composite**

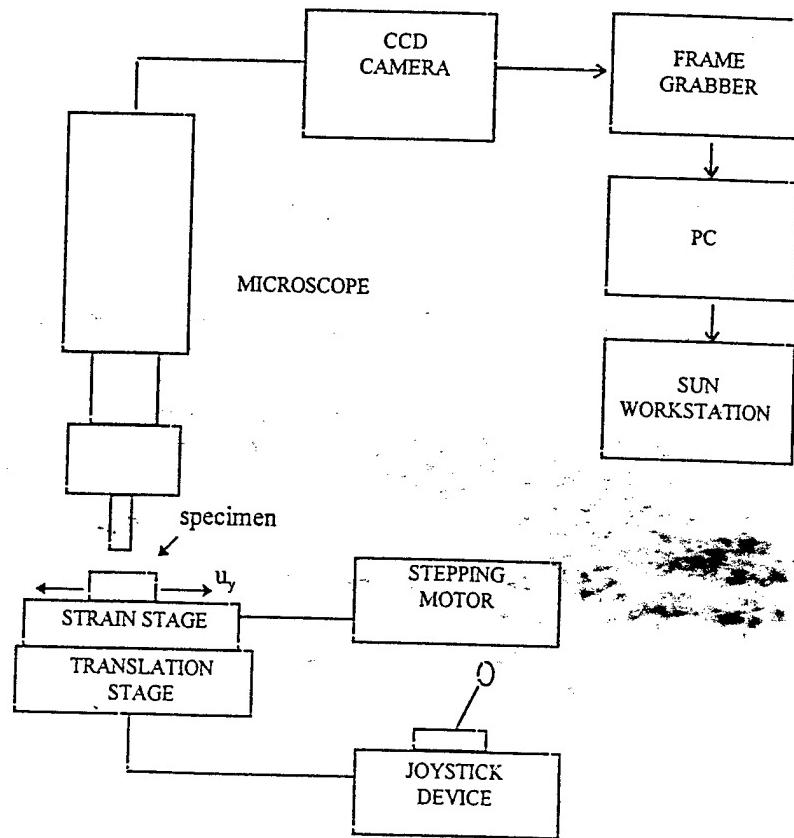
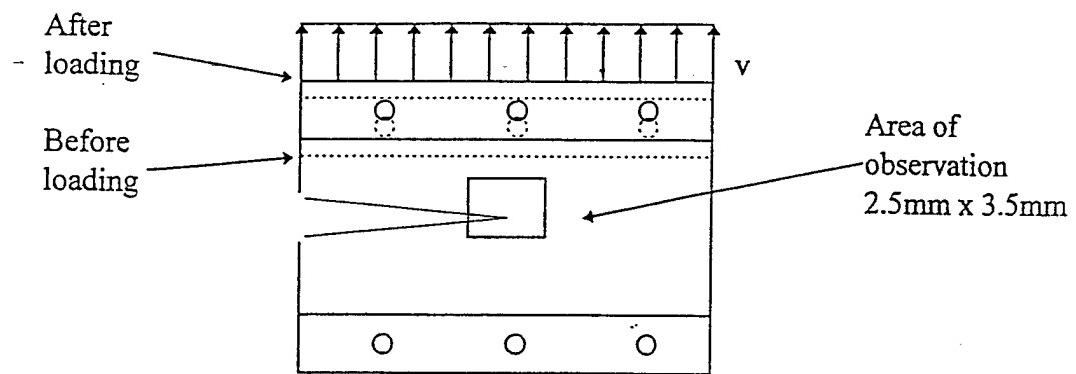
C. T. Liu  
And  
J. Gonzales

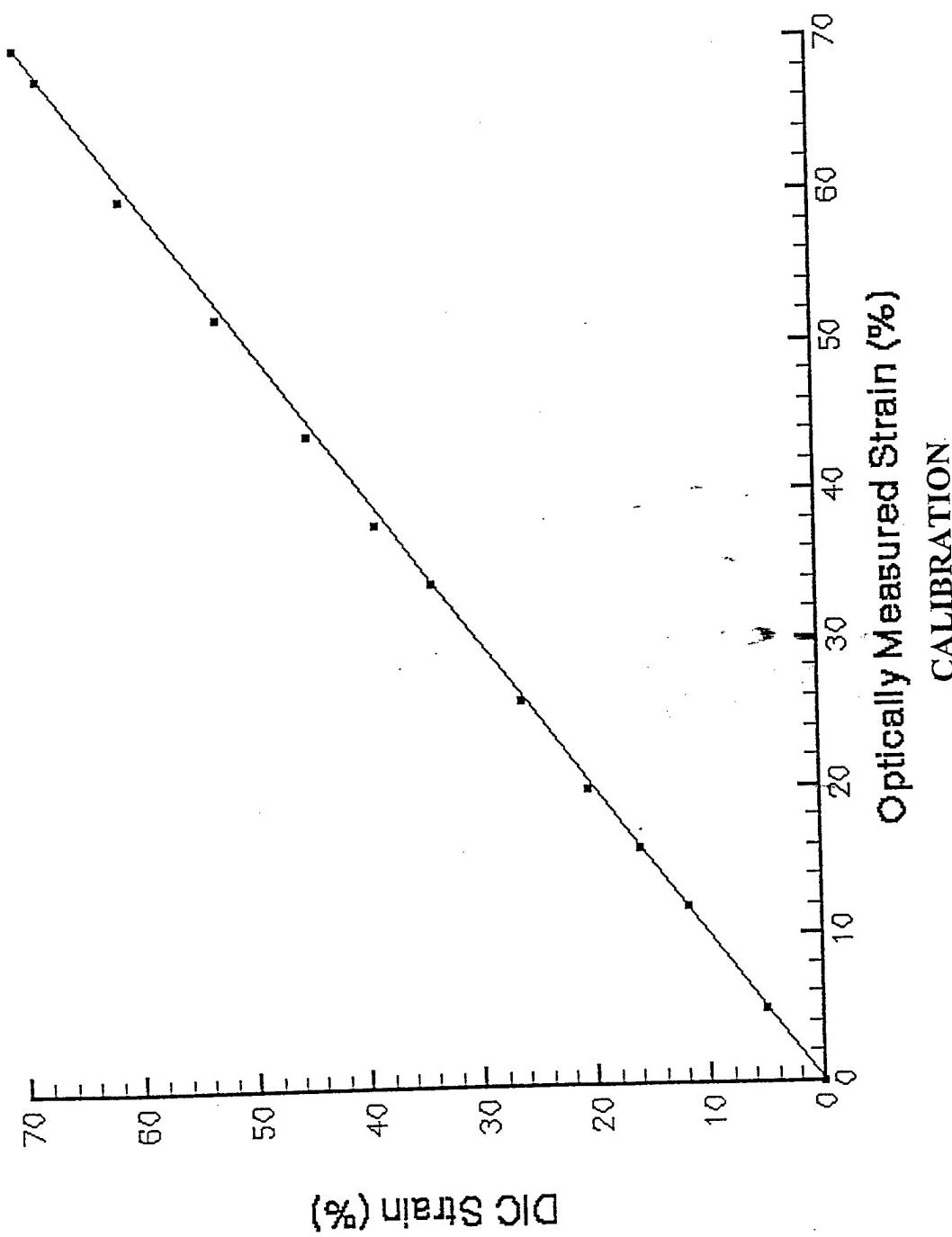
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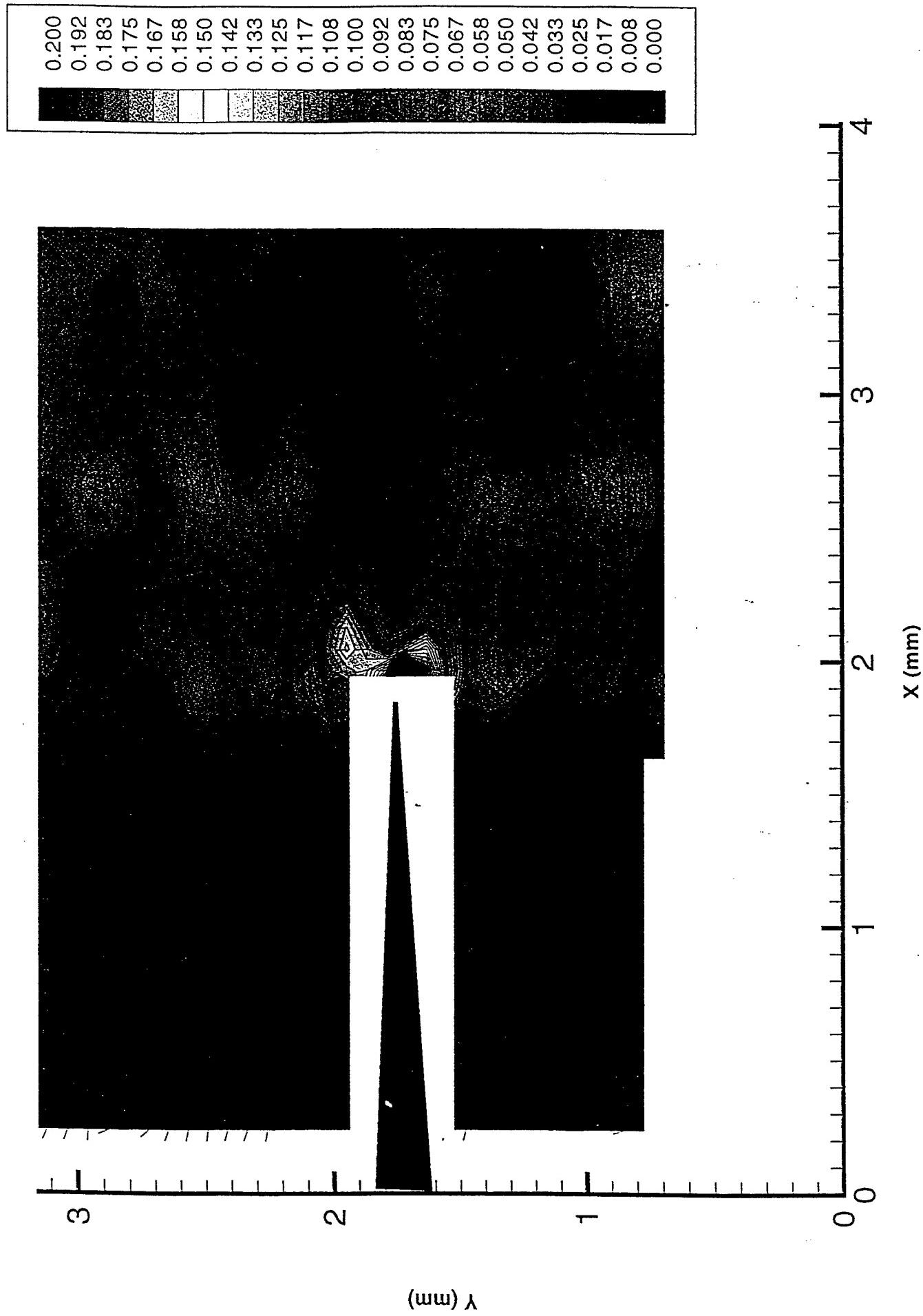
# **Objectives**

- **Investigate the Effect of Microstructure on the Strain Distribution near the Crack Tip.**
- **Determine the Local Strain Concentration Factor and Strain Rate near the Crack Tip.**

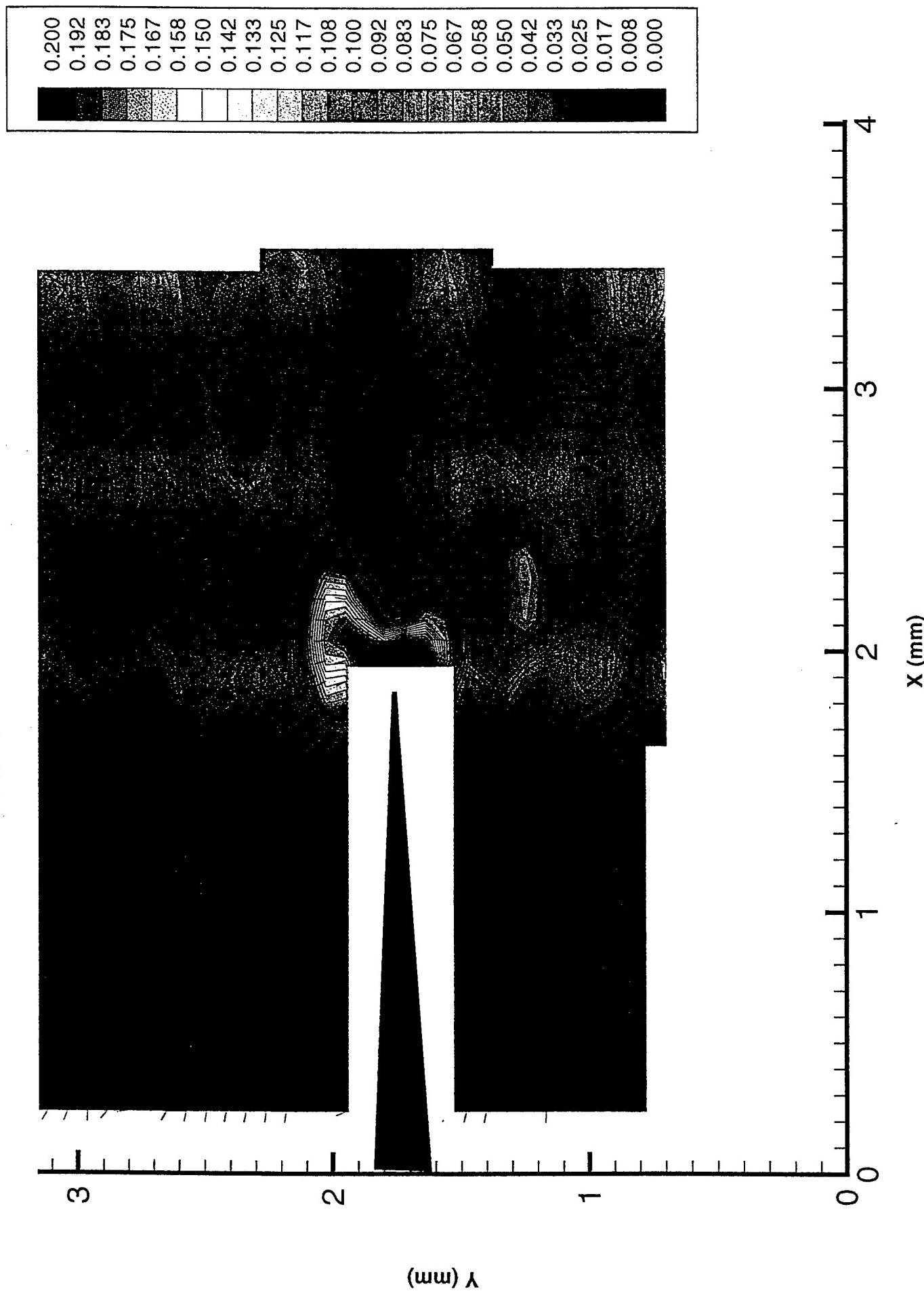




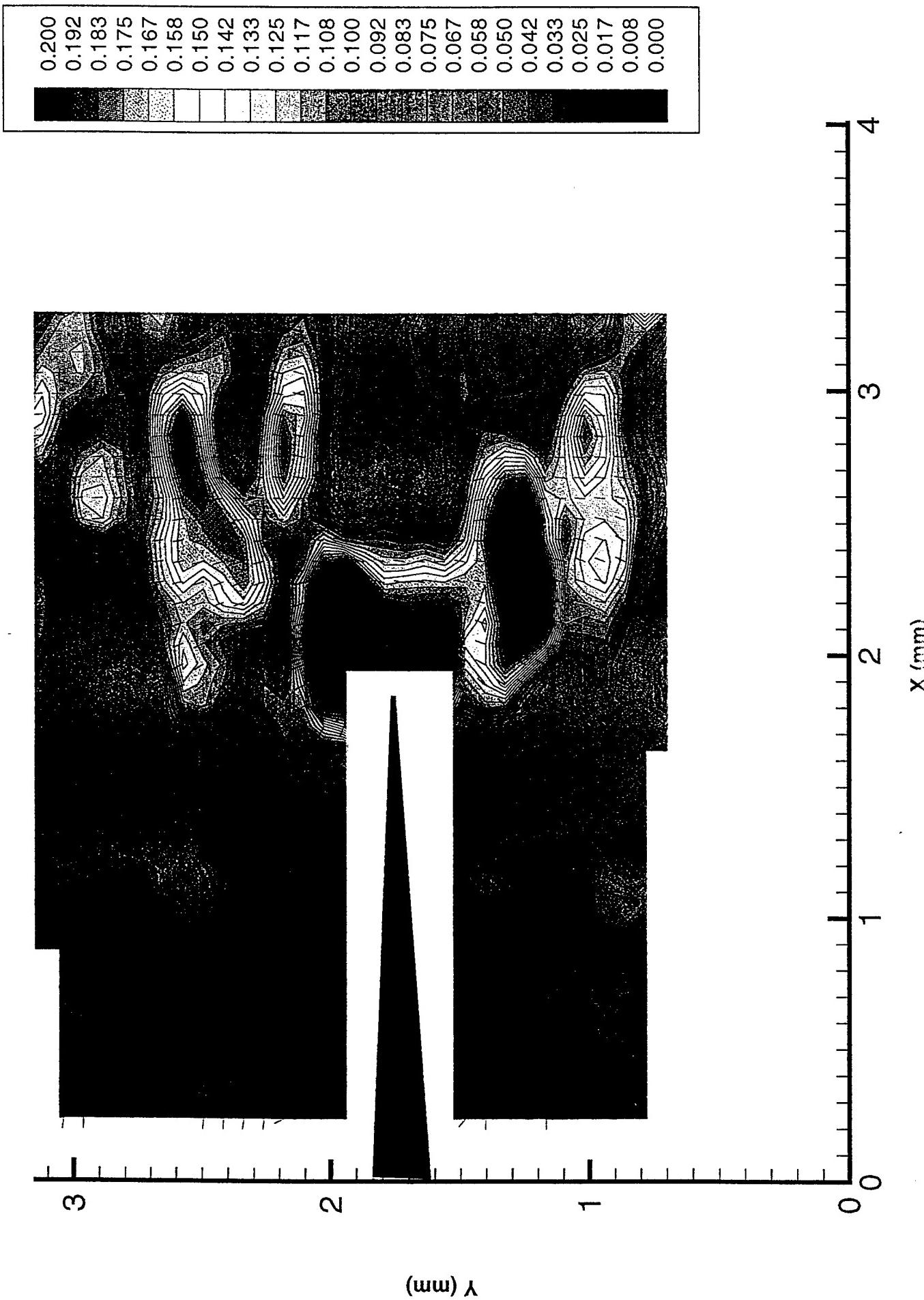
**Maximum Principal Strain Distribution for  
2.8% Far Field Strain  
Test 1**



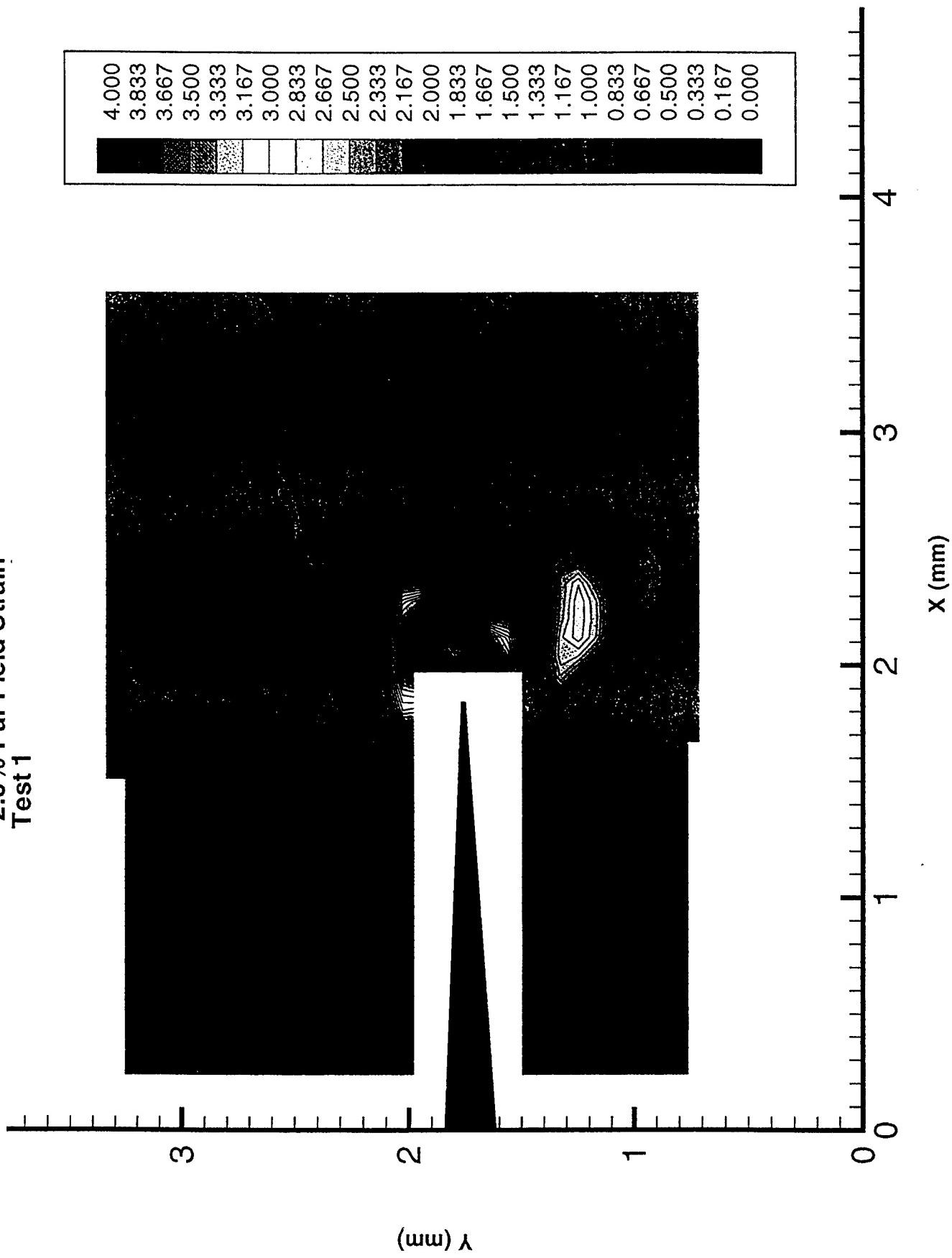
**Maximum Principal Strain Distribution for  
4.2% Far Field Strain  
Test 1**



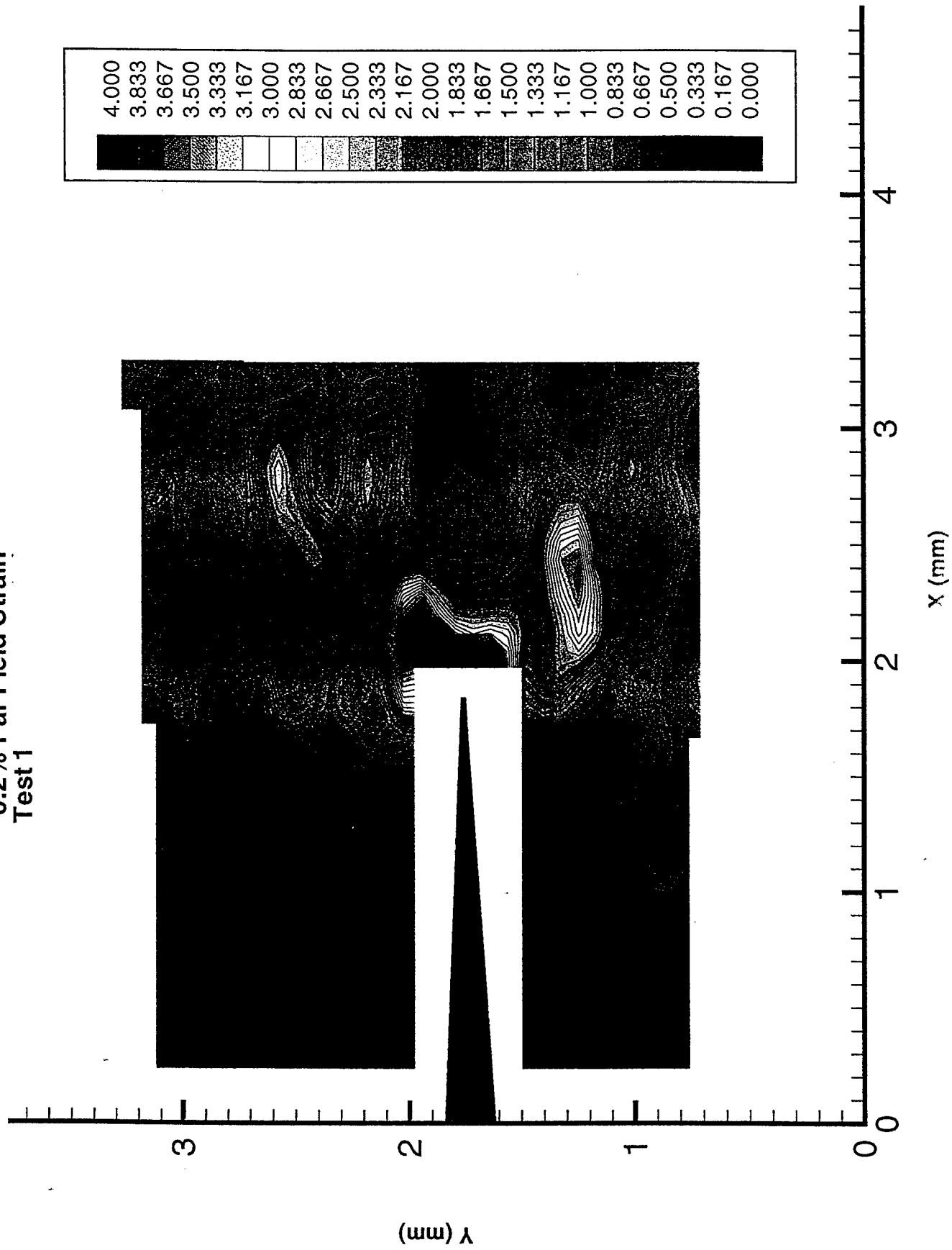
**Maximum Principal Strain Distribution for  
8.2% Far Field Strain  
Test 1**



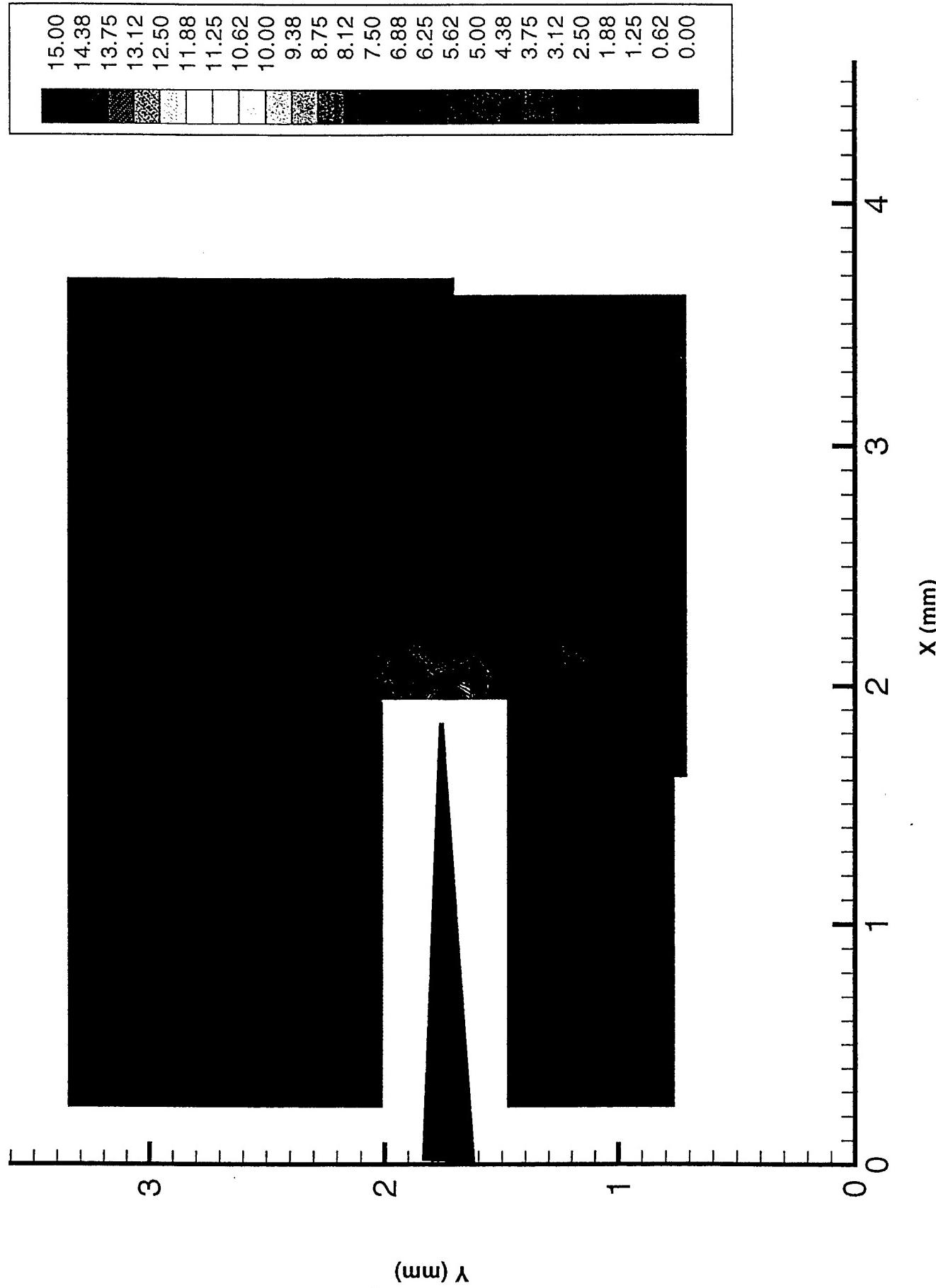
**Strain Concentration Distribution for Step 4  
2.8% Far Field Strain  
Test 1**



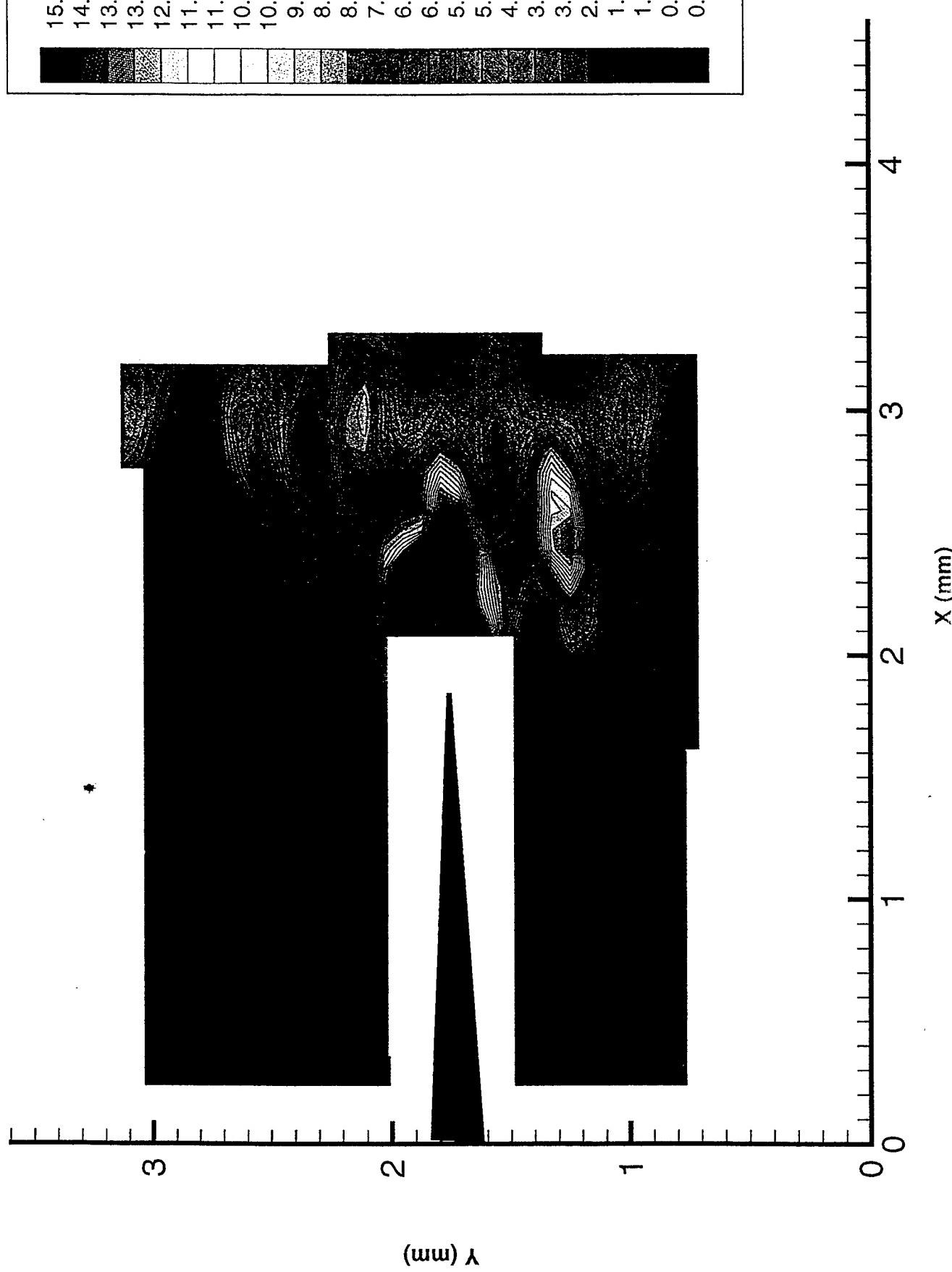
**Strain Concentration Distribution for Step 12**  
**8.2% Far Field Strain**  
**Test 1**



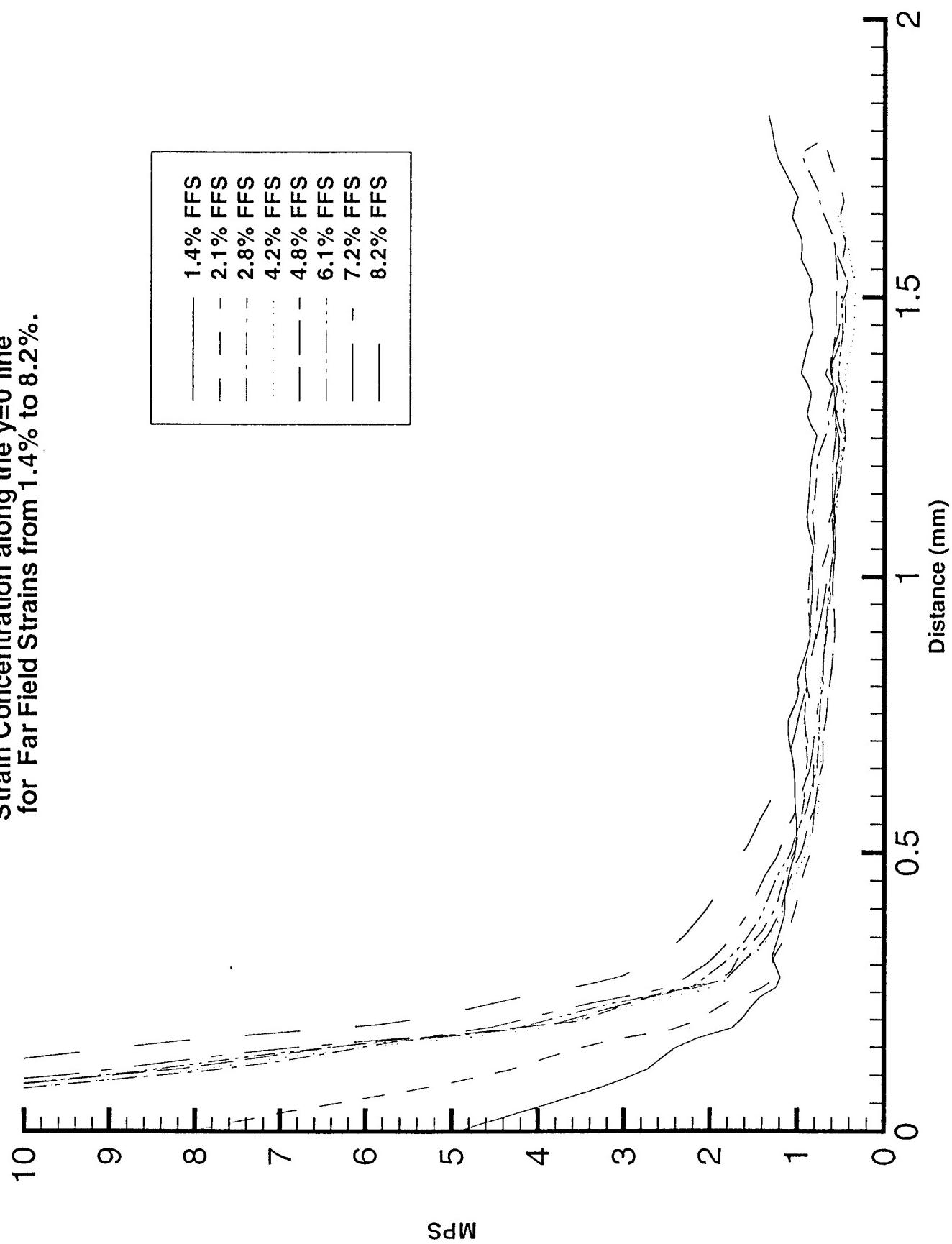
**Non Dimensional Local Strain Rate in the y- Direction  
At 0.001 (1/s) Far Field Strain Rate and 2.5% Far Field  
Strain. Test 1**



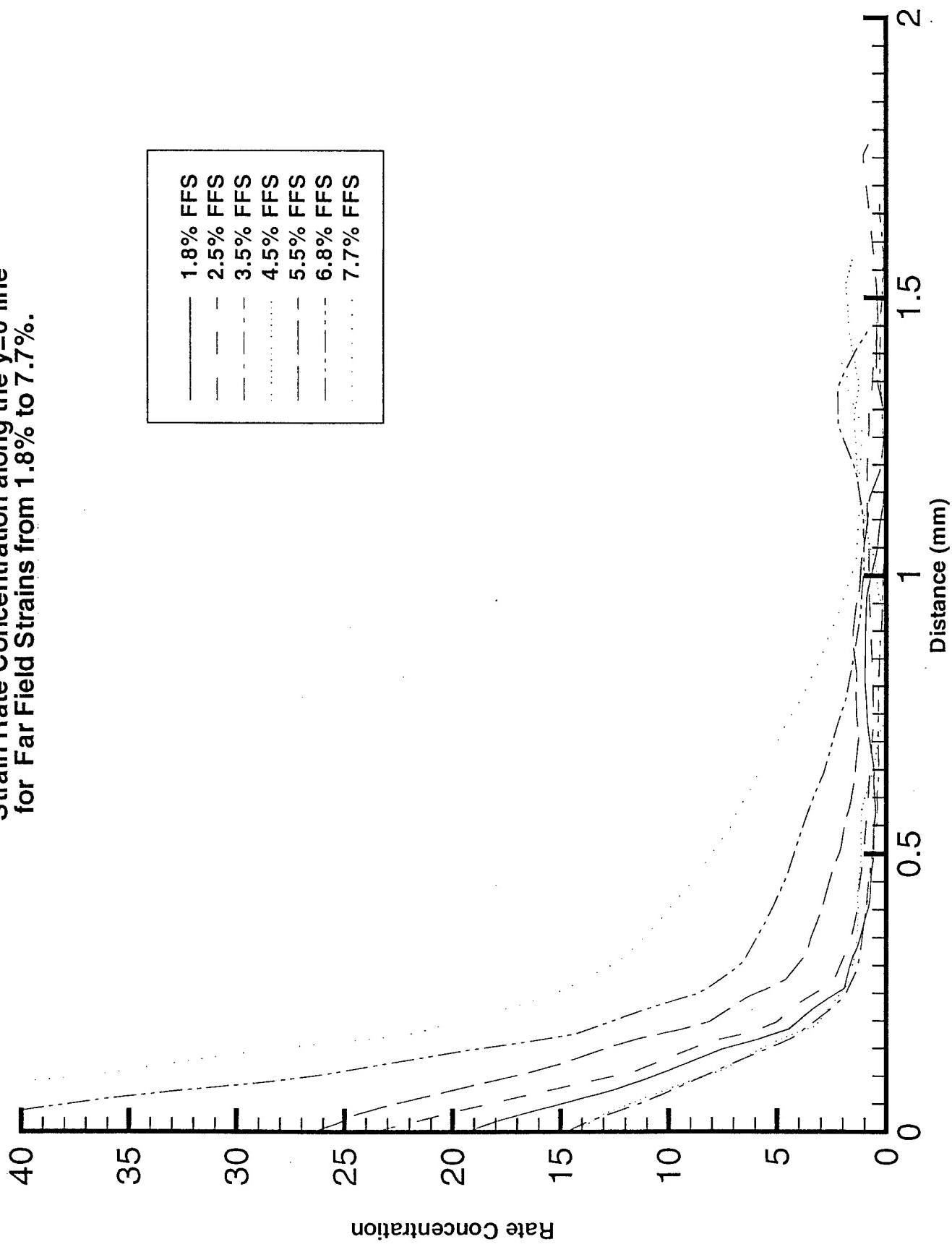
**Non Dimensional Local Strain Rate in the Y - Direction  
At 0.001 (1/s) Far Field Strain Rate and 8.5% Far Field  
Strain. Test 1**



Strain Concentration along the  $y=0$  line  
for Far Field Strains from 1.4% to 8.2%.



**Strain Rate Concentration along the  $y=0$  line  
for Far Field Strains from 1.8% to 7.7%.**



## **Conclusions**

- 1. The Digital Image Correlation Technique can be used to Determine Strain Fields where Inhomogeneous Deformations are presented.**
- 2. The High Strain Field is Localized within 1 mm of the Crack Tip.**
- 3. The Microstructure of the Material has a Significant Effect on the Strain Fields near the crack tip.**
- 4. The Crack Growth Mechanism Consists of Void Generation and Coalescence with the Main Crack Tip.**